

and *Dichachiton* as well as of *Ametrogephyrus*, *Chiton larvaeformis* Blainville. Thus these names will encumber the synonymy of *Cryptoplax*, but otherwise make no confusion.

THE ACANTHODORIDIDAE OF THE CALIFORNIA COAST

BY F. M. MAC FARLAND

The genus *Acanthodoris* was founded by J. E. Gray in 1850 for the reception of the *Doris pilosa* of O. F. Müller, described originally from the Norwegian coast, but of very wide distribution, having been taken generally in northern European waters and in the Mediterranean, on the coasts of Iceland, Greenland, New England, Alaska and the western coast of British America, while two very doubtful varieties have even been recorded from Tasmania and New Zealand.

The genus diagnosis as extended by Gray ('57) was based upon the careful anatomical and systematic studies of Alder and Hancock ('51, '55), and has been amended somewhat by later writers, especially by Bergh ('79, '80). The type species of the genus is recorded as occurring generally in the northern circumpolar waters, but it is not improbable that a closer study of a larger series of individuals may establish varietal and even specific differences between the Alaskan and the European forms. Specific distinction is much more probable in the case of the two South Pacific varieties of *A. pilosa* (O. F. M.) described by Bergh ('05). One of these has been provisionally identified by Eliot ('07) as being identical with *Ac. mollicella* Abraham. But two valid species seem to be found in European waters, *Ac. pilosa* (O. F. M) and *Ac. subquadrata* A. & H., while Verrill has recorded the genotype and three other species, two of which are undoubtedly varieties only, from the New England coast. The genus seems to reach much greater diversity in Pacific waters as the following list indicates.

1. *Ac. pilosa* (O. F. M.). Kyska Harbor, Popoff Strait; Yukon Harbor (Shumagin Island), Alaska. Bergh ('80).

2. *Ac. pilosa* var. *albescens* Bergh. Kyska Harbor, Alaska.

Bergh ('80); Vancouver region, British Columbia. O'Donoghue ('21).

3. *Ac. pilosa* var. *purpurea* Bergh. Unalaska, Alaska. Bergh ('80).

4. *Ac. coerulescens* Bergh. Nunivak Island, Alaska. Bergh ('80).

5. *Ac. hudsoni* MacFarland. Monterey Bay, California. MacFarland ('05).

6. *Ac. brunnea* MacFarland. Monterey Bay, California. MacFarland ('05).

7. *Ac. rhodoceras* C. & E. San Pedro, California. Cockerell and Eliot ('05).

8. *Ac. nanaimoensis* O'Donoghue. Vancouver region, B. C. O'Donoghue ('21).

To the above list are to be added two new species described in the present paper, *Ac. lutea* and *Ac. columbina*, to which are appended further details of structure exhibited by the other three California species, *Ac. hudsoni*, *Ac. brunnea* and *Ac. rhodoceras*.

ACANTHODORIS, Gray. 1850.

Acanthodoris Gray, J. E., Figs. Moll. Animals, IV, 1850, p. 103; Guide Moll. British Mus., 1857, p. 207; Alder and Hancock, Monog. British Nudibr. Moll., VII, 1855, p. 43, Appendix p. xvii; Adams, H. & A., Genera Recent Moll. II, 1858, p. 56; Sars, G. O., Moll. Reg. Arct. Norvegiae, 1878, p. 308; Bergh, Gattungen nord. Doriden, Arch. Naturgesch. XLV, 1879, 1, p. 356; Nudibr. Moll. North Pacific, II, Proc. Acad. Nat. Sci. Philadelphia, 1880, p. 88; Monog. d. Polyceraden, III, Verh. k. k. zool-bot. Ges. Wien, XXXIII, 1883, p. 170; System Nudibr. Gasteropoden, 1892, p. 158; Eliot, C., Monog. British Nudibr. Moll. (Alder and Hancock) VIII, 1910, p. 155; MacFarland, F. M., Proc. Biol. Soc. Washington XVIII, 1905, p. 51; Bull. Bureau Fisheries, Washington, XXV, 1906, p. 144; O'Donoghue, C. H., Trans. Roy. Canadian Inst. Toronto, XIII, 1921, 1, p. 168.

Body soft, sub-depressed; notaeum thickly covered with short villi; margin of rhinophore aperture lobed; branchial plumes

few, tripinnate, arranged in a circle; head wide, veliform, expanded into tentacular lobes at the sides.

Armature of labial disk of minute hooks, below with projecting thickenings of the cuticle. Radula rather narrow, rhachis naked, first pleural tooth very large, hamate, external pleurae few (4-8), smaller. Buccal crop connate with pharyngeal bulb.

Glans penis usually armed, vagina usually very long.

ACANTHODORIS HUDSONI MacFarland. Plate II, Figure 1.

Acanthodoris hudsoni MacFarland, F. M., Proc. Biol. Soc. Washington, XVIII, 1905, p. 51; Bull. Bureau of Fisheries, Washington, XXV, 1906, p. 144; O'Donoghue, C. H., Trans. Roy. Canadian Inst., Toronto, XIII, 1921, p. 170; Ibid, XIV, 1922, p. 164.

The body is plump and highly arched, the dorsum is covered everywhere with soft, closely-set, slender papillae. The ground color is a clear, translucent, yellowish white or pinkish white, the papillae, the branchiae, and the clavus of the rhinophores being tipped with lemon yellow, the mantle edged with the same color. The rhinophores are perfoliate with ca. 24 leaves, and are retractile within low sheaths bearing numerous short papillae which are similar to those of the dorsum.

The branchial plumes are five in number, wide-spreading, bipinnate, non-retractile within a sheath, arranged in a circle surrounding the low anal papilla, and including numerous papillae similar to those of the general dorsum.

The labial armature is light yellow, composed of minute hooks in a triangular area on either side of the lower portion of the mouth opening. The ventral plate between these areas is broad, slightly concave, pointed behind and forked in front, the anterior tips projecting freely into the mouth opening. The formula of the narrow radula is 27 (5-6. 1. 0. 1. 5-6). The rhachis is naked, the first pleural tooth (Pl. II, Fig. 1) is strong and compressed, with a quadrangular, basal portion, much thickened below and along its anterior margin, which is prolonged upward in a strong, slightly curved, blunt hook. The posterior portion of the base forms a thinner, plate-like expansion, overlapping externally the first pleural tooth of the suc-

ceeding row. The total height of the tooth averages ca. 0.375 mm., the hook alone measuring 0.135 mm., the ratio of the height of the hook to that of the whole element being nearly as 1 : 2.8, a proportion which holds good in any part of the radula, with but slight variation. No great difference in size is to be found between the younger and older teeth of the same radula in any of the Acanthodorids with which I am familiar, and the proportionate height of the hook in comparison to the total height of the whole first lateral in unworn teeth seems to be a characteristic for each species. The inner margin of the hook bears four to seven well developed denticles midway of its length. In some cases four or five, additional, much smaller denticles may appear below the larger ones, but they are inconstant, and scarcely more than vestiges.

The remaining pleurae, five or six in number, are small and nearly of the same size, 0.090 mm. to 0.105 mm. in length, and somewhat resemble the first pleurae in form, the anterior and dorsal portions being thickened, and prolonged backward to a point, a thin keel-like expansion extending to the tip below and uniting it to the basal part. The outer laterals of *Ac. hudsoni* are larger and better developed than those of the other Californian Acanthodorids, as may be readily seen by comparing Fig. 1 of Plate II with Figs. 4, 7, 8, 9 and 10, which are drawn to the same scale of magnification from corresponding regions of the radulae of the other species.

The vas deferens is ca. 8.5 mm. long, the proximal 3.5 mm. segment of which is thicker and glandular, the remainder more slender and muscular, and passes over into the cylindro-conical preputium, 1.0 mm. in length by 0.4 mm. in diameter, which incloses at its base the short, bluntly conical glans, armed with minute hooks. The uterine duct is very slender and short, passing directly from the anterior, inner margin of the gland complex to the spermatheca, receiving the duct of the pyriform spermatocyst just before entering the former. The spermatocyst is ca. 0.5 mm. in length, the more spherical spermatheca 1.0 mm. in diameter. From the latter the vaginal duct, ca. 7.0 mm. in total length, describes an S-shaped loop, thickens suddenly into a well-marked glandular segment ca.

1.2 mm. in length, with four longitudinal grooves upon its surface, the intervening ridges thus formed being transversely lobulated at intervals. From this portion the vaginal duct passes directly outward, dilating gradually into the vagina.

This apparently rare species was originally taken in shore collecting at Point Pinos, near Pacific Grove, California. It has also been recorded by O'Donoghue ('21, '22) as occurring at Jesse Island, False Narrows and Cardale Point, all in the Vancouver Island region, British Columbia. I have taken an occasional specimen in shore collecting at various places in the near vicinity of Point Pinos, but never in any considerable number.

ACANTHODORIS BRUNNEA MacFarland. Plate II, Figure 7.

Acanthodoris brunnea MacFarland, F. M., Proc. Biol. Soc. Washington, XVIII, 1905, p. 52; Bulletin Bureau of Fisheries, Washington, XXV, 1906, p. 146; O'Donoghue, C. H., Trans. Roy. Canadian Inst. Toronto, XIII, 1921, p. 171.

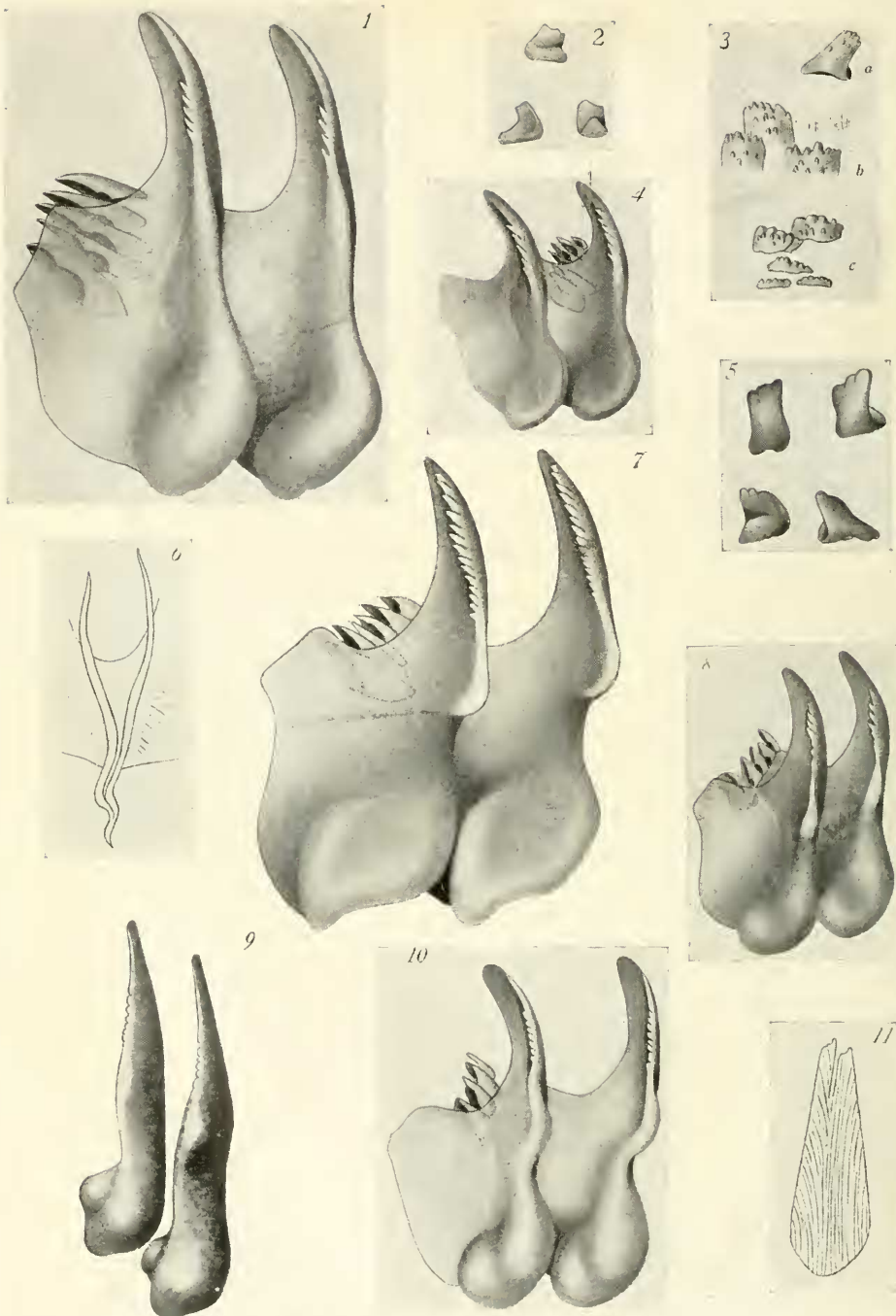
The body outline is oval, broadest in front, the mantle is firm and covered with thickly-set, conical tubercles. The general ground color of the dorsum is brown, flecked with irregular blotches of deep brown or black in varying amount. Scattered spots of light lemon yellow occur between the tubercles, and the mantle is edged more or less completely with the same color. The stalks of the branchial plumes are yellowish-brown, marked on the inner side with two narrow longitudinal lines of dark brown, the tips lemon yellow. The rhinophores are a deep blue-black, tipped with yellowish-white. The under surface of the animal is in general yellow or whitish, the ventral surface of the mantle, the head, the tentacles and sides of the body being sprinkled with fine dark brown or black dots.

The head is large, being continued laterally into broad, veliform tentacles. The foot is nearly quadrangular, tapering slightly behind into the short tail. The rhinophores are long, the clavus tapering, perfoliate with 20-28 leaves, each edged with a narrow line of white or pale yellow, and retractile within low sheaths with tuberculate margins. The branchial plumes are seven in number, wide-spreading, bipinnate, arranged in an incomplete circle surrounding the anal papilla and about ten

other papillae similar to the dorsal tubercles. The anal papilla is low and its margin is edged with light yellow.

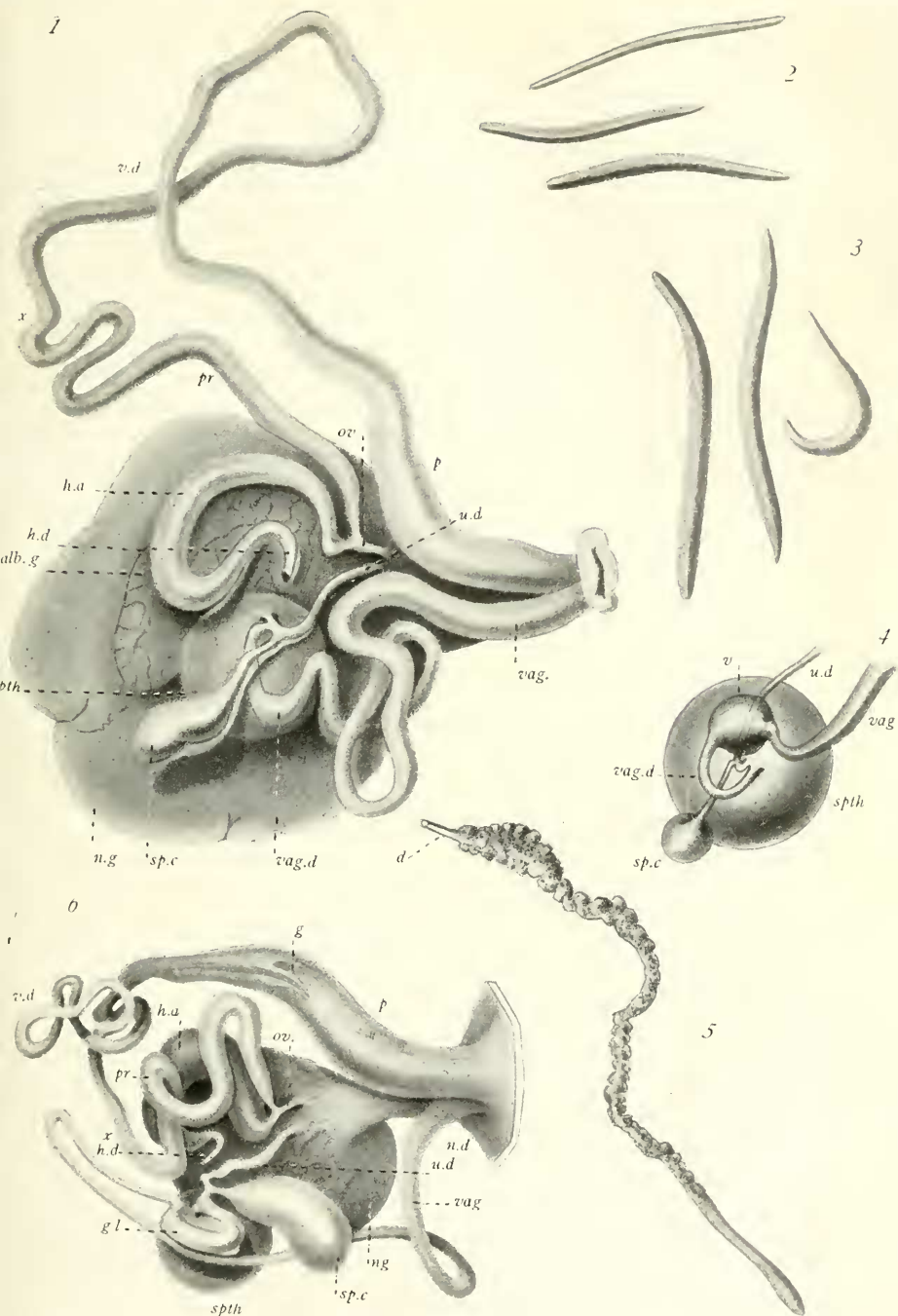
The cuticle of the labial disk is light brown, the labial armature is composed of minute, mosaic-like hooks, arranged in a triangular area on the lower part of either side of the mouth tube entrance, incomplete below, being separated by a single, median cuticular plate, slightly concave longitudinally, its blunt anterior end projecting freely into the mouth opening. The radula formula is 24-28 (6-7. 1. 0. 1. 6-7), its rhachis is very narrow and naked, the first pleural tooth (Plate II, Fig. 7) is large and compressed, its quadrangular base is strongly thickened below and in front, but much thinner behind, the posterior lamina being prolonged upward as a squarish, slightly thickened shoulder. The strong, slightly curved hook, extending upward as a prolongation of the anterior portion of the base, is strengthened on its inner margin by a thickened ridge, which joins the base below in a conspicuous rounded prominence. The inner margin of the hook bears 14-19, well developed denticles along nearly its whole length. The outer pleurae are six to seven in number, similar in general form to the first pleural tooth but much simplified, the anterior basal end and the dorsal margin being slightly thickened, tapering away behind the prolongation, being united below to the base by a thin, keel-like expansion. The total average height of the first pleural tooth is 0.375 mm., the hook alone averaging 0.157 mm., the ratio of hook length to total height being as 1:2.4 nearly. The outer pleurae range in length from 0.180 mm. to 0.150 mm., the outermost one being the shortest.

The vas deferens is long, attaining 18 mm. in length, the proximal one-half of which is glandular, and closely attached to the anterior genital complex, being set off from the free, distal, muscular portion by a distinct constriction. The preputium is cylindro-conical, 3.0 mm. long by 1.0 mm. in average diameter, the short contained gland is armed with minute hooks. The vaginal duct and vagina are very short, scarcely reaching 6.0 mm. in total length and giving no external evidence of any glandular differentiation such as is found in *Ac. hudsoni*.



1, ACANTHODORIS HUDSONI. 2, 6, 8, A. LUTEA. 3, 4, A. RHODOCERAS.
 5, 9, 10, 11, A. COLUMBINA. 7, A. BRUNNEA.

O. H. MacFarland, del



I. MacFarland, del.

1, 2, 5, ACANTHODORIS COLUMBINA. 3, 6, A. LUTEA. 4, A. RHODOCERAS.

Habitat: Dredged off hard bottom in 5 to 10 fathoms depth off Cabrillo Point (Point Alones) and off the entrance to Monterey Harbor, and from various similar localities near by in Monterey Bay, California. Dredged by O'Donoghue ('21) in about 15 fathoms in Nanoose Bay, and also taken at False Narrows and Mudge Island, Vancouver Island region, British Columbia.

ACANTHODORIS RHODOCERAS Cockerell & Eliot. Plate II, Figures 3, 4; Plate III, Figure 4.

Acanthodoris rhodoceras Cockerell & Eliot, Notes on a Collection of Californian Nudibranchs. Journal of Malacology, XII, 1905, 3, p. 38-39, Pl. VII, Figs. 3, 4.

This species was based upon a single specimen taken at San Pedro, California, and no further study has been published upon it. To the kindness of Dr. Myrtle E. Johnson, of National City, California, I am indebted for two specimens of this form, collected at San Diego, and I have also examined a colored sketch of the living animal made by her.

The animals were soft, flattened oval in outline, and somewhat contracted by the preservative. The largest of the two measured 10 mm. in length, 6.7 mm. in width, and 4.0 mm. in height, being slightly smaller than the one studied by Cockerell and Eliot (12 mm. by 10 mm. by 5 mm.). The pale, yellowish-grey dorsum is everywhere thickly set with conical papillae, the majority of which are tipped with black. Larger and smaller papillae are intermingled, though toward the margins the smaller-sized ones predominate. Near the mantle margin is a nearly continuous, narrow, black line, with scattered indications of a narrow, yellowish edging at intervals beyond it. The rhinophores are almost completely retracted within distinct, low sheaths, which bear four or five short, conical processes of different lengths, some of which are tipped with black. The clavus is perfoliate with thirteen leaves. The branchial plumes are five in number, bi- and tripinnate, flat and spreading, the most anterior one situated in the median line, the others forming with it a star-shaped group. Each of the posterior plumes has a strong, hinder branch, nearly equaling the

size of an independent plume. Several scattered, low papillae, similar to those of the general dorsum, are included within the branchial circlet. No trace of an encircling rim, formed by the union of the surrounding papillae, such as is described by Cockerell and Eliot can be recognized in either specimen.

As indicated by these writers the mantle contains but few spicules, mainly arranged near the margin and the branchial area. In consequence the mantle is decidedly softer to the touch than that of the other Californian species.

The labial disc, oval in outline, bears two, strongly developed, triangular, lateral areas, the labial armature. These are widest below, and narrow somewhat upward, extending nearly to the top of the tube, and are separated below by a narrow area, occupied by the ventral, forked, blade-like process of the cuticle. The labial elements are strongly developed, each consisting of a thickened, squarish base prolonged obliquely upward into a stout process, triangular in side view, and roughly quadrangular as seen from above. The free margin is cleft into a variable number of unequal lobes, as many as ten such being found in the widest elements. The smaller, less developed elements near the posterior border of the armature (Pl. II, Fig. 3, *c*) are reduced to little more than narrow strips, representing the upper, irregular margin of the larger ones (*b*). On the upper, sloping surface of these latter are a variable number of small prominences, not readily distinguishable from the longitudinally striated texture of the element. The labial elements vary in width at the free margin from 0.008 mm., in the anterior border of the armature, to 0.013 mm. in the middle region, and to 0.011 mm. at the posterior border. Typical elements from these three regions are shown in figure 3, *a*, *b* and *c* of Plate II. That the irregular cusp margin is not due to wear is evident, since it appears in the youngest elements of the posterior region as well as in the older ones in front. The vertical height of a typical larger element is 0.137 mm. The ventral space between the lateral armature areas is occupied by a median plate of cuticle projecting freely in front of the armature into the oral opening with its blunt, bifid end. It is 0.336 mm. long and 0.108 mm. in maximum width. The anterior

cleft extends back 0.084 mm. from the blunted tips, the remaining portion forming a single plate. The structure is faintly striated longitudinally.

The narrow radula of the smaller specimen contained 36 transverse rows of teeth, that of the larger but 32; in each the last four or five were incompletely formed, the first eight or ten being free from the sheath and functional. The radula formula is 32-36 (5-6. 1. 0. 1. 5-6). The rhachis is narrow and naked, the first lateral is of the form characteristic of the genus (Pl. II, Fig. 4). It is much flattened laterally, and consists of a somewhat rectangular base, thickened in front, the posterior half being thin and wing-like. The lower, anterior angle of the base is thick and rounded, and tapers upward gradually into the anterior margin of the short, curved, blunt hook. The hook bears from three to six distinct denticles upon its inner margin, about midway of its length, while below these a variable number (two to four) of vestigial ones may occur. The total height of the first lateral in the smaller specimen ranges from 0.228 mm. to 0.249 mm., of which the hook alone makes up 0.084 mm. to 0.093 mm. In the larger the first lateral ranges from 0.278 mm. to 0.339 mm., in total height, the hook alone varying from 0.104 mm. to 0.132 mm., the proportion of height of the hook to total height of the tooth thus being close to the ratio of 1 to 2.6 throughout. The remaining laterals are five to six in number, project obliquely upward and backward, and in general outline resemble the form of the first lateral. They decrease in size outward in the row, and range in length from 0.022 mm. to 0.055 mm. The dorso-anterior margin is somewhat thickened, and tapers to a point above, which is supported ventrally throughout its whole length by a thin expansion of the base. A slight, angular projection, about midway of its length on the inner face, is the only interruption of the smooth outline of this thickened, anterior ridge. The figure of the radula given by Cockerell and Eliot ('05, Pl. VII, fig. 4) does not represent the whole of the base of the first lateral, nor do the contours of the hook, the denticles, nor the remaining laterals agree with my findings. Since the magnification of their figure is not given, size comparisons cannot be drawn.

To the brief notes on the internal anatomy given by Cockerell and Eliot may be added the following observations, measurements, where given, being taken from the 10 mm. specimen. The pseudo-peritoneum is everywhere colorless, the blood gland covers the central nervous system and the posterior curvature of the *ingluvies buccalis*. The intestine, curving widely to the right, presents the usual small, pear-shaped sack on its right side, close to its origin from the stomach. The liver, ovotestis, and the anterior genital complex are of a uniform greyish color. The hermaphroditic duct passes directly to the right from the anterior end of the hermaphroditic gland to its dilated ampulla, lying in a nearly closed, C-shaped loop upon the inner surface of the complex. Its distal end disappears at the upper, anterior margin beneath the loops of the glandular segment of the *vas deferens*, which branches off from it just as it enters the *nidamental gland*. This glandular, or prostatic portion of the *vas deferens* is deep brown in color, is 6 mm. long and 0.21 mm. in diameter, and rests in a deep groove in the anterior and upper surface of the *nidamental gland*; its upper loop passing below and in contact with the *spermatotheca*. It describes two main loops nearly at right angles with each other, a proximal, ventral one, directed downward and forward, and a distal one, upward and backward. Beyond this glandular segment the *vas deferens* contracts into a more slender, muscular portion, which forms a free loop toward the median plane around the projecting end of the *radula sack*, below the *oesophagus*, thence returning outward and upward to dilate into the *preputium*. The muscular segment is 4 mm. in length and 0.1 mm. in diameter, is thick-walled, and free from pigment, and is marked off from the glandular segment by a slight constriction, in addition to the change in total diameter. The *preputium* is 3.4 mm. long, cylindrical, and tapers gradually into the *vas deferens* proximally. Its lining is thrown into numerous longitudinal folds. The inclosed *glans penis*, at the fundus of the *preputium*, is short and bluntly conical, 0.12 mm. in length and in basal diameter. No armature whatever can be made out, either upon the *glans* itself, or lining the *preputium*, or extending into the *vas deferens*, nor do serial sections reveal the pres-

ence of small, transparent, hooks as described by Cockerell and Eliot, though the irregular elevations caused by folds in the lining mucosa may simulate such appearances, when seen in a transparent preparation. The epithelium lining the muscular segment of the vas deferens is made up of low, ciliated cells, resting upon a very distinct basement membrane, and surrounded by muscle fibers in two longitudinal layers, with a broader layer of circular muscle fibers between them. In the proximal portion of the muscular segment, just before the glandular division is reached, the epithelial cells are arranged in groups of different heights, varying from 0.014 mm. to 0.035 mm. in height, the corresponding cilia measuring from 0.014 mm. to 0.016 mm. in length. The intervening lumen is thus rendered irregular in outline, being bounded by these varying elevations and depressions. As many as five such may be found in a single cross section, the lumen between them taking on a corresponding stellate outline. When seen through the thick muscular walls these irregularities might be taken for an armature, but none in fact is present.

The vagina and vaginal duct (Pl. III, fig. 4, *vag.*), are exceptionally short, passing straight inward to the upper margin of the anterior genital complex, and measuring but 2.2 mm. from the external opening to the insertion of the retractor muscle. Here the duct bends sharply downward, describes a small wide loop backward, and dilates into a small, vesicle (*v*) in contact with the inner, anterior face of the spermatheca. This vesicle is almost spherical in form, 0.6 mm. in diameter, and has moderately thick, glandular walls. From its proximal end the vaginal duct (*vag. d.*) continues in a loop upward and backward for ca. 1.5 mm. and opens into the spherical spermatheca (*spth.*) 1.5 mm. in diameter, upon its upper surface. Close to its entrance emerges the uterine duct (*u. d.*), 1.4 mm. in length, which passes diagonally downward and outward across the anterior face of the spermatheca, and enters the nidamental gland close to the entrance of the oviduct. It receives the duct of the pyriform spermatocyst (*spc.*) immediately beyond its own emergence from the spermatheca, and measures 0.7 mm. in length by 0.4 mm. in diameter, its slender

duct being 0.7 mm. in length. The total length of the female channel from the external opening to the spermatheca is 5.1 mm., and, including the uterine duct from the latter organ to its disappearance in the nidamental gland, is but 6.1 mm. in all. A comparison of figure 4 of Plate III with figures 1 and 6 of the same plate will show the great dissimilarity between the vaginal ducts of *Ac. rhodoceras* and those of *Ac. columbina* and *Ac. lutea*. In this species it is reduced to almost a minimum in length, while in all other species of the genus so far described, with the exception of *Ac. brunnea* and *Ac. hudsoni*, it is extremely long, its great length being hitherto considered as an important generic character. The presence of a penis armature is another generic character here lacking, though it is perfectly obvious otherwise that this species is an *Acanthodoris*. In those forms of *Acanthodoris* taken in the Southern Hemisphere the penis armature seems to be also lacking (*Ac. pilosa* var. *Novae Zealandiae* Bergh ('05), ?=*Ac. mollicella* Abraham, Eliot ('07); *Ac. pitosa* var. *pallida* Bergh ('05); and *Ac. metulifera* Bergh ('05)?=*Ac. globosa* Abraham). It is in accordance with these facts that I have modified the genus diagnosis on p. 3 of this paper to cover these exceptions.

ACANTHODORIS LUTEA, sp. nov. Plate II, Figures 2, 6, 8; Plate III, Figures 3, 6.

To Dr. Myrtle E. Johnson I am also indebted for a living *Acanthodoris*, collected by her at Cayucos, San Luis Obispo County, California, Feb. 9, 1921, and for a colored sketch of the living animal. On July 26, 1922, a similar individual was found by me in tide pools of Colorado Reef, off Moss Beach, south of Montara Point, San Mateo County, California. A detailed study of these two specimens has shown that they are undoubtedly distinct from any hitherto described species.

The body is highly arched, nearly equally rounded in front and behind, and of a bluntly oval outline, being slightly broader in the region of the rhinophores than elsewhere. The dorsum is thickly set everywhere with low, conical papillae, the longest reaching 1.5 mm. in length and 0.7 mm. in diameter, near the mid-dorsum, and becoming shorter and more slender

toward the margins. Between the larger papillae numerous smaller ones are scattered. The general ground color of the mantle is orange red, and the papillae are of a deeper shade of the same color. Between the papillae everywhere the surface is sprinkled with minute dots of lemon yellow, the same sprinklings extending up the stalks of the rhinophores, the clavus of which shades into a deep red tip, the leaves being edged with the same color. The ventral surfaces of the foot and mantle are orange yellow. The branchial plumes are greyish-white. The color of the animal is strikingly conspicuous in the tide pool, and at a distance quite resembles a bit of orange peel.

The rhinophores are erect, slightly divergent, the stalk inclining forward, the conical clavus and tip curving backward. The clavus is perfoliate with 26 leaves, united in front by a longitudinal ridge, the whole being retractile within low sheaths bearing a small number of papillae of varying size, similar to those of the dorsum. The branchial plumes are nine in number, low, spreading, non-retractile within sheaths, arranged in a nearly complete circle around the prominent anal papilla, and inclosing likewise some 10-12 papillae, similar to those of the dorsum. The head is broad and veliform, with a broad, shallow, median notch in front, the outer angles being produced into short triangular tentacles, and the whole head margin is edged with the same deep red color as found on the dorsal papillae. The moderately wide mantle margin extends beyond the edge of the foot, except at the tip of the short, blunt tail. The anterior margin of the foot is bilabiate, with a slight, median notch.

The dimensions of the largest Cayucos specimen were: length 22.5 mm., maximum width 14.8 mm., length of foot 18.4 mm., width of foot 11.5 mm., the greatest height of body 6.6 mm. The Moss Beach specimen was somewhat smaller, measuring 17.5 mm. in length, and 9 mm. in greatest width.

The mantle is thick and densely spiculate throughout its whole extent. All the spicules are simple (Pl. III, fig. 3), with no indications of tubercles or branches of any kind such as Meyer and Moebius ('65) figure for *Ac. pilosa*. All are slightly curved, and some of the shorter ones may even assume a hook-